**MCLEAN DEVELOPMENT MECHANISM**
**PROJECT DESIGN DOCUMENT FORM (CDM-PDD)**
**Version 03 - in effect as of: 28 July 2006**

**CONTENTS**



**Annexes**

## SECTION A. General description of project activity

### A.1. Title of the project activity:

>>

Zhejiang Jiaxing Ultra-supercritical Power Generation Project

**Version:** 03

**Date:** 01/03/2012

The version history of the PDD is summarized as follows:

| Version Number | Date | Description and reason of revision |
|---|---|---|
| 01 | 09/09/2010 | Prepared for public comments |
| 02 | 01/06/2011 | Revised on auditor' CARs and CLs |
| 03 | 01/03/2012 | Revised under review |

### A.2. Description of the project activity:

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Zhejiang Jiaxing Ultra-supercritical Power Generation Project (hereafter referred to as the Project), located on Liuli Bay, Pinghu City, Zhejiang Province, P.R. China, is built by Zhejiang Zhe'neng Jiahua Power Generation Co., Ltd. The project activity is a newly built project, which involves the installation of two sets of 1,000MW ultra-supercritical units, the annual operational hours are 5,000hs and the annual output is estimated to be 9,470 GWh, which will be sold to Zhejiang Grid, a sub-grid of an independent regional grid - China East Power Grid (CEPG). The objective of the Project is to satisfy the increasing local power needs and improve the ability of power generation of local power grid.

The Project activity is newly-built, so the scenario existing prior to the start of implementation of the project activity is to supply electricity by existing power plants within CEPG. 2×600MW supercritical coal-fired power plant is identified as the baseline scenario of the project activity.

The ultra-supercritical coal-fired power generation technology utilized in the Project is now the advanced coal-based technology with the biggest single unit capacity and top efficiency in China and makes the energy efficiency up to 43.4%[1]. Compared with other coal-fired power generation technologies in China, this relatively cleaner technology enhances operational performance significantly so as to decrease coal consumption rate and achieve $CO_2$ emission reduction. It is expected that the Project will obtain average emission reductions of annual 336,640 $tCO_2e$ and total 3,366,400 $tCO_2e$ over the ten-year fixed crediting period.

The Project will contribute to the sustainable development in the Project host country and local area in the following ways:

[1] The energy efficiency is calculated by using formula (6) of ACM0013 (version 4.0)

 The Project will mitigate local conflict between supply and demand of electricity, optimize the power supply structure of the CEPG and improve the regulating capability within the CEPG;

 The Project will create employment opportunities by providing about 300 formal posts;

 The Project will reduce pollutant emissions by consuming lower crude coal per kWh generation owing to higher energy efficiency compared with other coal-fired power generation technologies;

 The installation of desulphurization facility, low-nitrogen burner and high-efficiency electrostatic precipitator in the Project will also reduce $SO_2$, $NO_x$ and flue gas dust emissions.

**A.3. Project participants:**

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| Name of Party involved (*) ((host) indicates a host Party) | Private and/or public entity(ies) project participants (*) (as applicable) | Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No) |
|---|---|---|
| China (host) | Zhejiang Zhe'neng Jiahua Power Generation Co., Ltd. | No |
| Finland | Nordic Carbon Fund Ky | No |
| (*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required. | | |

**A.4. Technical description of the project activity:**

**A.4.1. Location of the project activity:**

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**A.4.1.1. Host Party(ies):**

>>

China

**A.4.1.2. Region/State/Province etc.:**

>>

Zhejiang Province

**A.4.1.3. City/Town/Community etc:**

>>

Pinghu City

**A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):**

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The project power plant, which is 6km away from Zhapu Town, 16km away from Pinghu City, 41km away from Jiaxing City, 90km away from Shanghai City, 102km away from Hangzhou City, is located on Liuli Bay, with the coordinate of 30°36′10″N, 121°08′10″E.

For information in detail, please refer to the following maps:


Figure 1. The Location of the Project

## A.4.2. Category(ies) of project activity:

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Sectoral Scope 1: Energy industries (non-renewable energy)

## A.4.3. Technology to be employed by the project activity:

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The purpose of the project activity is to satisfy the increasing local power needs and improve the power supply capacity of local power grid. The project activity employs ultra-supercritical coal-fired power generation technology and it could improve the power generating efficiency of coal-fired power plant, reduce coal consumption rate and realize the emission reduction from coal burning.

- The project activity is newly-built, so the scenario existing prior to the start of implementation of the project activity is to supply electricity by existing power plants within CEPG.
- The baseline scenario: 600 MW supercritical coal-fired power generation units will be installed to deliver the same service as the proposed project in the absence of the Project activity.
- The scenario of the project activity is to implement the project activity. The project owner will install two sets of 1,000MW ultra-supercritical power generation units.

The project activity involves the installation of two set of 1,000MW ultra-supercritical units of coal-fired generation. A set of unit mainly include: a 1,000MW generator, a 1,000MW turbine and a boiler with maximum evaporation capacity of 3,101t/h. The process of coal based thermal power plant is: chunks of coal are crushed into fine powder and are fed into a boiler where it is burned. Heat from the burning coal is used to generate steam that is used to spin turbine, which turn generator to produce electricity.

The 1,000-megawatt-per-unit ultra-supercritical technology, a kind of high-efficiency cleaner coal power generation technology, is now the advanced coal-based electricity generation in China. Compared with other coal-fired power generation technology, this technology significantly improves energy efficiency. Thus coal consumption rate is reduced and $CO_2$ emission reduction is achieved.

Under the project activity, the boiler is made by Harbin Boiler Factory. The steam turbines and the generators are both made by Shanghai Electric Group Co., Ltd. The key technical specifications of the project activity are shown below:

**Table 1. Key Technical Specifications of the Project and baseline**

| | | Item | Unit | Value |
|---|---|---|---|---|
| **The Project** | Boilers | Type | | HG-3101/27.46-YM3 |
| | | Maximum continuous evaporation of superheated steam | t/h | 3,101 |
| | | Superheated steam pressure | MPa(a) | 26.25 |
| | | Superheated steam temperature | ℃ | 605 |
| | | Reheat steam inlet/outlet pressure | MPa(a) | 6.19/5.94 |
| | | Reheat steam inlet/outlet temperature | ℃ | 367/603 |
| | | Average lifetime | years | 30 |
| | Steam turbines | Type | | N1000/26.25/600/600 |
| | | Unit capacity | MW | 1,000 |
| | | Main steam flow | t/h | 2,700 |
| | | Main steam inlet pressure | MPa(a) | 26.25 |
| | | Main steam inlet temperature | ℃ | 600 |
| | | Average back pressure | kPa(a) | 11.8 |
| | | Reheat steam inlet temperature | ℃ | 295.8 |
| | | Average lifetime | years | 30 |
| | Generators | Type | | THDF 125/67 |
| | | Rated power | MW | 1,000 |
| | | Rated voltage | kV | 27 |
| | | Efficiency | % | ≥99 |
| | | Average lifetime | years | 30 |
| | Net fuel consumption rate | | g/kWh | 283.08 |
| | Energy Efficiency | | % | 43.4 |
| | Plant Load Factor | | % | 57 |
| | Operation period | | yr | 20 |
| **Baseline** | Gross fuel consumption rate | | g/kWh | 299 |
| | Energy Efficiency | | % | 38.95 |
| | Load Factor | | % | 95 |
| | Operation period | | yr | 20 |

The monitoring equipments include electronic belt scales and electronic energy meters. In the project power plant, two electronic belt scales will be installed. A belt conveyor equipped with an electronic scale can feed coal for two boilers at the same time. The electronic belt scale is used to monitor the coal combusted by the project before the fuel goes into the burner. Two electricity meters (main meter and

backup meter) with the accuracy of no lower than 0.5S are installed at the step-up station to monitor electricity fed to CEPG.

The Project will via two circuit 500kV transmission lines connect to 500kV Jiashan Substation, which is a part of CEPG.

With all technologies and facilities provided domestically, the proposed project involves no technology transfer from abroad.

### A.4.4. Estimated amount of emission reductions over the chosen crediting period:

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The project activity applies a 10-year crediting period. It is expected to generate an estimated average annual emission reduction of 336,640 tCO2e and 3,366,400t$CO_2$e during the fixed crediting period of the project activity (01/07/2011-30/06/2021).

**Table 2. The Estimated Amount of Annual and Total Emission Reductions**

| Years | Estimation of annual emission reductions in tonnes of $CO_2$e |
|---|---|
| 01/07/2011~31/12/2011 | 168,320 |
| 01/01/2012~31/12/2012 | 336,640 |
| 01/01/2013~31/12/2013 | 336,640 |
| 01/01/2014~31/12/2014 | 336,640 |
| 01/01/2015~31/12/2015 | 336,640 |
| 01/01/2016~31/12/2016 | 336,640 |
| 01/01/2017~31/12/2017 | 336,640 |
| 01/01/2018~31/12/2018 | 336,640 |
| 01/01/2019~31/12/2019 | 336,640 |
| 01/01/2020~31/12/2020 | 336,640 |
| 01/01/2021~30/06/2021 | 168,320 |
| Total estimated reductions (tonnes of $CO_2$e) | 3,366,400 |
| Total number of crediting years | 10 |
| Annual average of the estimated reductions crediting period (t$CO_2$e) | 336,640 |

### A.4.5. Public funding of the project activity:

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There is no public funding from Annex I Parties for the project activity.

## SECTION B. Application of a baseline and monitoring methodology:

### B.1. Title and reference of the approved baseline and monitoring methodology applied to the project activity:

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1. ACM0013 “Consolidated baseline and monitoring methodology for new grid connected fossil fuel fired power plants using a less GHG intensive technology”,(version 04.0.0, EB56)

2. “Tool for demonstration and assessment of additionality”, (version 05.2, EB39)

3. "Tool to calculate the emission factor for an electricity system", (version 02.1.0, EB60)

For more information regarding the methodology, please refer to the link:

http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

**B.2. Justification of the choice of the methodology and why it is applicable to the project activity:**

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The Project activity meets all the applicability criteria of ACM0013 (version 04) for the following reasons:

| Applicable conditions | Project activity |
|---|---|
| The project activity is the construction and operation of a new fossil fuel fired grid-connected electricity generation plant that uses a more efficient power generation technology than that what would otherwise be used with the given fossil fuel category; | The Project involving 2×1,000MW ultra-supercritical technology is the construction and operation of a new coal-fired grid-connected electricity generation plant with higher efficiency than other power generation technologies in China. The Project will supply the CEPG electricity. |
| One fossil fuel category should be used as main fuel in the project power plant. In addition to this main fossil fuel category, small amounts of other fossil fuel categories can be used for start-up or auxiliary purposes, but they shall not comprise more than 3% of the total fuel used annually on an energy basis; | Coal is used as main fuel in the project power plant. Diesel oil is used for start-up. Annual amount of diesel oil consumed by the project plant is about 2,016t[2], which equals to 2,937.51t coal equivalent[3]. The diesel oil comprises 0.11% of the total fuel used annually on an energy basis. |
| The project activity does not include the construction and operation of a co-generation power plant; | The Project does not include the construction and operation of a co-generation power plant; |
| Data on fuel consumption and electricity generation of recently constructed power plants are available; | Data on fuel consumption and electricity generation of recently constructed power plants of the CEPG are available. |
| The identified baseline fuel category is used in more than 50% of total generation by utilities in the geographical area within the host country, as defined later in the methodology, or in the entire host country. To demonstrate this applicability condition data from the latest three years shall be used. Maximum value of same fossil fuel generation estimated for three years should be greater than 50%. | The coal-fired electricity generation occupies more than 50% of total generation in the latest three years in China[4]. Maximum value of same fossil fuel generation estimated for three years is greater than 50%. In 2009, coal-fired electricity generation is 77.3% of the total. In 2008, coal-fired electricity generation is 76.8% of the total. In 2007, coal-fired electricity generation is 77.7% of the total. |

Therefore, ACM0013 (Version 04.0.0) is applicable to the project activity.

**B.3. Description of how the sources and gases included in the project boundary:**

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On the basis of *Chinese regional Baseline Emission Factor of new grid connected fossil fuel fired power plants using a less GHG intensive technology in 2010* issued by Chinese National Development and Reform Commission on 25 November 2010, the spatial extent of the Project boundary includes the power plant at the Project site and all power plants connected to the CEPG considered for the calculation of baseline $CO_2$ emission factor ($EF_{BL,CO2,y}$). The CEPG, one of the regional grids of China, covers Shanghai Municipality and Zhejiang, Jiangsu, Anhui and Fujian provinces.

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[2] Page 42, Volume (II) of Feasible Study Report

[3] According to Appendix 4 of China Energy Statistical Yearbook 2009, 1 kg diesel oil equals to 1.4571 kg coal equivalent.

[4] Chapter 7-1, China Statistical Yearbook 2010.

In the calculation of project emissions, only $CO_2$ emission from fossil fuel combustion in the project plant is considered. In the calculation of baseline emissions, only $CO_2$ emission from fossil fuel combustion in power plant(s) in the baseline is considered.

The flow diagram of the project boundary is described as follows:

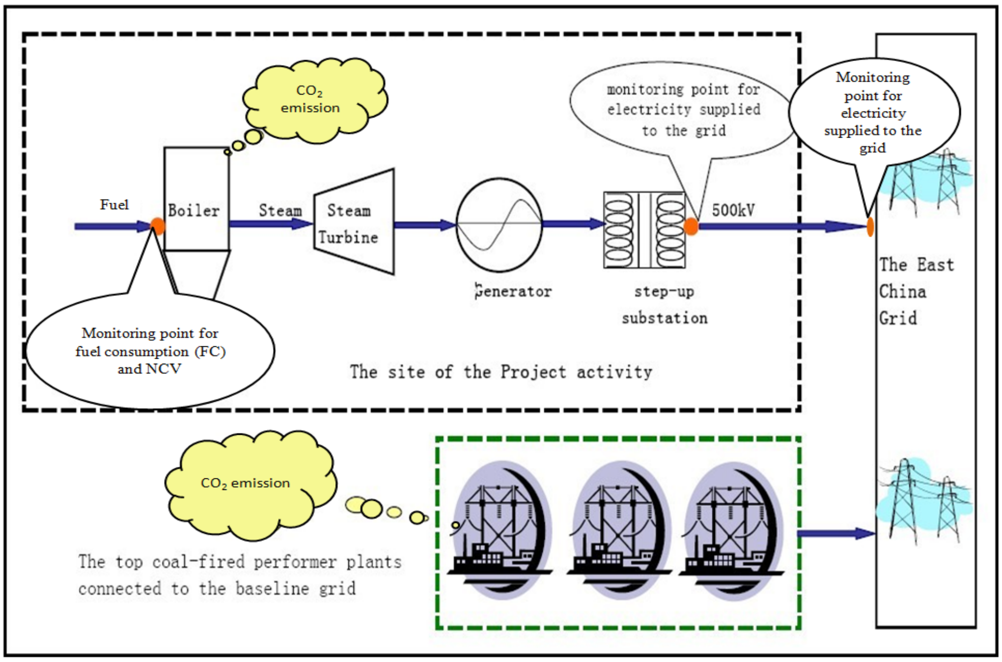


**Figure 2. The Flow Diagram of the Project Boundary**

The greenhouse gases included in or excluded from the project boundary are listed as follows:

| | Source | Gas | Included? | Justification / Explanation |
|---|---|---|---|---|
| **Baseline** | Power generation in baseline | $CO_2$ | Included | Main emission source. |
| | | $CH_4$ | Excluded | Excluded for simplification. This is conservative. |
| | | $N_2O$ | Excluded | Excluded for simplification. This is conservative. |
| **Project Activity** | On-site fuel combustion due to the project activity | $CO_2$ | Included | Main emission source. |
| | | $CH_4$ | Excluded | Excluded for simplification. |
| | | $N_2O$ | Excluded | Excluded for simplification. |

**B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:**

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According to ACM0013 (version 04), baseline scenario is identified using the following steps:

**Step 1. Identify plausible baseline scenarios**

As per ACM0013 (version 04), the identification of alternative baseline scenarios should include all possible realistic and credible alternatives that provide outputs or services comparable with the proposed CDM project activity (including the proposed project activity without CDM benefits). These alternatives need not consist

solely of power plants of the same capacity, load factor and operational characteristics (i.e. several smaller plants, or the share of a larger plant may be a reasonable alternative to the project activity).

Possible realistic and credible alternatives are composed of those listed in table 3.

**Table 3. Plausible Alternatives of the Project Activity**

| Plausible baseline scenarios | | Plausible alternatives |
|---|---|---|
| 1 | The project activity not implemented as a CDM project | A1 2*1000MW Ultra-supercritical coal-fired power generation |
| 2<br>The construction of one or several other power plants instead of the Project activity. | 2.1 Power generation using the same fossil fuel category (coal) as that in the Project activity, but technologies other than that used in the Project activity. | A2 2*600MW Super-critical coal-fired power generation<br>A3 2*600MW (and 4*300MW) Sub-critical coal-fired power generation |
| | 2.2 Power generation using fossil fuel categories other than that used in the Project activity. | A4 2*300MW Natural gas power generation<br>A5 2*300MW Fuel oil power generation |
| | 2.3 Other power generation technologies such as renewable power generation. | A6 Power generation using hydro power<br>A7 Power generation using wind power, biomass power, and solar energy<br>A8 Power generation using nuclear energy |
| 3 | Import of needed electricity from connected grids (including the possibility of new interconnections) | A9 Import of electricity from connected grids |

In accordance with ACM0013 (version 04), the alternatives should meet three conditions below:

1)Deliver similar services to the grid (e.g. peak and base load);

2)Cover all relevant power plant technologies that have been constructed or are under construction or are being planned;

3) Exclude baseline alternatives that are not in compliance with Chinese laws and regulations.

The analysis of each baseline scenario alternative is provided as follows.

**1. The project activity not implemented as a CDM project**

This alternative (A1) (2*1000MW ultra-supercritical coal-fired power generation) is in compliance with Chinese mandatory laws and regulations on electricity enterprises. It is a plausible baseline scenario which can deliver similar services (peak and base load power) as the project activity.

**2. The construction of one or several other power plants instead of the Project activity**

**2.1 Power generation using the same fossil fuel category (coal) as in the Project activity, but technologies other than that used in the Project activity**

In China, coal-fired installed capacity is 74% of total power generation capacity[5]. It is obvious that Chinese power generation system is dominated by coal-fired power, and this fact will not change in a quite long time ahead. Consequently, construction of one or several coal-fired power plants with comparable total capacity is possible alternative.

[5] http://news.xinhuanet.com/fortune/2010-08/30/c_12497266.htm

The typical technologies using coal providing similar service as the proposed project are mainly two types, supercritical technology and subcritical technology.

In term of the *Guiding Catalogue for the Adjustment of Industrial Structure (2005)*[6] issued by NDRC, routine coal-fired power plants with single unit of 300MW and below except that in Tibet, Xinjiang and Hainan etc. small power grids are restricted to construct by China government. Therefore, subcritical coal-fired power unit with single unit of 300MW is not plausible baseline scenario within the CEPG.

The research in 2005 showed that coal fired power generation unit of a single unit of 600MW has been development direction of China' thermal power, and will soon become main fossil fired power generation unit, particularly supercritical unit[7]. Therefore, it is reasonable that the "2*600MW supercritical coal-fired power generation", and "2*600MW subcritical coal-fired power generation" are chosen to be the two alternatives of the proposed project.

Since 2005, 27 new-constructed coal-fired power generation projects have been approved by NDRC within the CEPG[8]. For these plants, 15 of 27 plants adopt supercritical technology. Furthermore, coal-fired power generation projects using more advanced supercritical and ultra-supercritical are particularly encouraged by government in 2005. Apparently, new-constructed coal fired power generation project using supercritical technology is common practice, instead of that using subcritical technology. In addition, the thermal efficiency of the power plant with supercritical technology is about 2.5% higher than the one applying subcritical technology. Therefore, 2*600MW coal fired power unit with lower efficient technology, subcritical technology, can also be excluded in a conservative manner.

In conclusion, A3 is not a baseline scenario, and A2 is a plausible alternative.

**2.2 Power generation using fossil fuel categories other than that used in the Project activity**

**A4: 2*300MW natural gas power generation**

According to the *Natural Gas Industry Policy*[9], the construction of power plants consuming natural gas can only provide peak load within the grid. It therefore is not a realistic baseline scenario.

Firstly, natural gas power plant only can be built as peak load power plant within ECG due to the following reason:

According to Notification of Natural Gas Utilization Policy (Fagainengyuan[2007] No.2155), natural gas is only permitted to be utilized in natural gas power plant served as peak load within electricity load center region with sufficient natural gas supply. ECG suffers a severe insufficiency of electricity and the region ECG covered is a typical electricity load center in China (31.11% of the total electricity consumption in China in 2008, according to China Electric Power Yearbook 2009), thus it is unlikely to build a natural gas base load power plant within ECG.

Secondly, the definition on peak load mentioned in the natural gas policy to the Project is same to the definition in the ACM0013, i.e. peak load is defined as a load factor of less than 3,000 hours per year, and can be proved from two parts:

- According to the Essential information on Power Plant Design, (reference at the

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[6] http://www.ndrc.gov.cn/zcfb/zcfbl/zcfbl2005/t20051222_54304.htm

[7] http://dchx.bokee.com/3362453.html

[8] http://nyj.ndrc.gov.cn/default.htm

[9] http://www.ndrc.gov.cn/zcfb/zcfbtz/2007tongzhi/t20070904_157244.htm

website,http://wenku.baidu.com/view/ce863036eefdc8d376ee32a3.html?from=related.), the load factor of the peak load power plant was less than 3,000 hours per year;

− The load factor of the natural gas power plant which severed as peak load plant in China is less than 3,000 hours per year:

According to China Power Yearbook 2009, Xiaoshan Natural Gas Power Plant, which served as peak load power plant and connecting to ECG had annual operation hours below 3000 hours (1907 hours). In addition, natural gas power plant with annual operation hours below 3000 hours are also observed in other power grid (Shenzhen Guangqian Power Co.,ltd (LNG), 2,680 hours, Guangdong Huizhou Natural Gas Power Plant, 2,498 hours, and Shenzhen Energy Group Dongbu Power Plant, 2,805 hours), also served as peak load power plant.

Based on the above analysis, we can conclude that the exclusion of alternative A4 (natural gas power plants) is reasonable and complied with the definition of base/peak load as per ACM0013.

**A5: 2*300MW fuel oil power generation**

The *Tenth Five-year Plan for Conservation and Substitution of Fuel Oil*[10] indicates that oil should be substituted by other energy in power generation in order to sharpen contradiction between supply and demand of oil. In addition, the oil fired power generation project only provide peak load within the grid in accordance to *Notice from State Council: On Further Strengthening Fuel-Efficient and Power-Saving*[11]. Accordingly, A5 is impossible to be the baseline scenario of the Project.

**2.3 Other power generation technologies such as renewable power generation**

**A6: Power generation using hydro power**

In view of China's latest survey on hydro energy resource[12], the hydro energy resource in western region where economy is laggard relatively constitutes 81.46% of the national sum, especially 66.70% in southwestern region; while, hydro energy theory reserves of eastern region where economy is developed and load is centralized accounts for only 4.88% of the national sum. The distribution of hydro energy resource is extremely unbalanced in China and relatively limited in eastern China. According to the survey from Agriculture Department of Zhejiang Province[13], there is no sufficient hydro energy resource remaining for new hydro power plants with comparable capacity or electricity generation.

Therefore, A6 is impossible to be an alternative of the Project.

**A7: Power generation using wind energy, biomass residues and solar energy**

The wind power output is extremely unstable for the particularity of wind energy, so power generation using wind energy cannot provide similar services (peak load) as the project[14]. Therefore, power generation using wind energy is not realistic alternative.

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[10] http://www.chinaccm.com/40/4002/400212/news/20030605/190215.asp

[11] http://www.ndrc.gov.cn/rdzt/jsjyxsh/t20080804_229550.htm

[12] http://www.shp.com.cn/news/info/2007/8/6/1410022956.html

[13] http://www.zjwater.gov.cn/document.aspx?id=70612

[14] http://114.255.43.243/news_view.asp?lm2=10&id=876

Within CEPG, annual productivity of biomass within CEPG is about 70.56 million ton[15], of which twenty percent can be used for power generation[16]. In the process of collecting, 19 percent of the total quantity will be wasted, i.e. collecting coefficient of the biomass residues is about 81% in China[17]. According to these, we can conclude that annual available biomass quantity within CEPG can amount to 11.43 million ton (=70.56*20%*81%). For biomass power generation, the average consumption rate of biomass is about 1.346kg/kWh[18]. It can be calculated that 13.46 million ton biomass would be consumed in order to supply similar electricity quantity as the project (10,000GWh/a). Obviously, there is no sufficient biomass residue for power generation in CEPG, which makes it difficult for biomass power plants to deliver similar service to the Project.

Solar daily radiation is only 3.2~3.8kWh per square meter in East China region[19], whereas more than 2,000kWh solar daily radiation per square meter is needed for solar energy power generation[20]. Obviously, the poor solar energy resource restrains solar energy power generation in CEPG. This can be confirmed by statistics in China Power Yearbook 2010 (p705). In 2009, the total electricity generation using renewable energy except hydro energy and nuclear energy is only 1,880GWh within CEPG, which is much smaller than the expected electricity quantity (9,470GWh) to the grid from the proposed project. In addition, due to instability coursed by natural conditions (e.g. day-night shift, season change, altitude, latitude, weather), solar energy power generation could not provide stable peak as the project.

Therefore, the alternative is not a realistic and credible alternative scenario.

Consequently, A7 is impossible to be a realistic alternative of the Project.

**A8: Power generation using nuclear energy**

Nuclear power plants apply the nuclear technology designed to extract usable energy from atomic nuclei via controlled nuclear reactions and the only method in use today producing power is via nuclear fission. In the plant the reactors heat water to produce steam, which is then converted into mechanical work for the purpose of generating electricity or propulsion. Nuclear power output cannot be quickly ramped up and down or that cannot even be quickly turned on and off. So nuclear power plant cannot be operated as peak load[21] as the project. Therefore, A8 cannot be a realistic and credible baseline scenario.

**3. Import of electricity from connected grids (including the possibility of new interconnections)**

**A9: Import of electricity from Central China Grid**

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[15] http://www.lw23.com/lunwen_1017732557/, page 19 of *Analysis on the distribution pattern of the crop-straw resource and the status quo of its application in China*.

[16] http://www.cn-hw.net/html/27/201010/19200.html

[17] http://www.shac.gov.cn/fwzx/nykj/kjdt/lwjx/201008/t20100816_1277077.htm

[18] http://www.xnyfd.com/sdfx/html/?28249.html

[19] http://baike.baidu.com/view/21294.htm

[20] http://www.xnyfd.com/yjbg/html/?26449.html

[21] http://www.in-en.com/article/html/energy_20072007012965512.html

Hydropower capacity account for high proportion (about 40%) of total capacity in China Central Power Grid (CCPG), and the output of hydropower varies seasonally. Power shortages are particularly serious in winter as a result of Changjiang River dry season coupled with coal shortage in Central China region[22].

Obviously, it is difficult for CCPG to provide peak load power generation service as the project. Therefore, the alternative 3, import of electricity from CCPG, is not a realistic and credible baseline scenario.

To sum up, there are two scenarios below to be realistic and credible alternatives of the Project activity. The most economically attractive alternative will be identified in the following Step 2 through investment comparison analysis.

**Table 4. The Selected Realistic and Credible Alternatives of the Project Activity**

| Alternative No. | Description |
|---|---|
| A1 | The project activity not implemented as a CDM project: 2*1000MW Ultra-supercritical coal-fired power generation |
| A2 | Power generation using the same fossil fuel category (coal) as in the Project activity, but super-critical coal-fired power generation technology: 2*600MW Super-critical coal-fired power generation |

**Step 2 Identify the economically most attractive baseline scenario alternative**

In line with ACM0013 (version 04), the levelized cost of electricity project is used as a financial indicator in the investment analysis for alternatives 1 and 2 identified in **Step 1**.

Based on Annex 5 of *Projected Costs of Generating Electricity (2005 update)* published by IEA[23], the formula applied to calculate the levelized cost of electricity project (LCOEP) is the following:

$$LCOEP = \frac{\sum\left[(I_t + M_t + F_t)(1+r)^{-t}\right]}{\sum\left[E_t(1+r)^{-t}\right]} \qquad (1)$$

Where

LCOEP: Levelized cost of electricity per kWh

$I_t$: Investment expenditures in the year t

$M_t$: Operation and maintenance expenditures in the year t

$F_t$: Fuel expenditures in the year t

$E_t$: Electricity generation in the year t

r: Discount rate

[22] http://www.cctime.com/html/2010-3-31/20103311441172396.htm

[23] http://www.iea.org/publications/free_new_Desc.asp?PUBS_ID=1472

The parameters needed in LCOEP calculation are listed in Table 5.

**Table 5. The Parameters and Assumptions Needed in LCOEP Calculation**

| No. | Parameter | Unit | Ultra-supercritical 2×1,000MW (1) | Supercritical 2×600MW (2) |
|---|---|---|---|---|
| 1 | Total installed capacity | MW | 2,000 | 1,200 |
| 2 | Construction period | Month | 32 | 30 |
| 3 | Operation period | Year | 20 | 20 |
| 4 | Plant Load factor | % | 57 | 95 |
| 5 | Discount rate（r）(3) | % | 8 | 8 |
| 6 | Capital expenditure per kW | RMB/kW | 3,771 | 3,562 |
| 7 | Material cost | RMB/MWh | 4 | 5 |
| 8 | Desulphurization cost per tone coal | RMB/ton coal | 4.34 | 4.34 |
| 9 | Denitration cost per ton coal | RMB/t coal | 3.873 | 3.873 |
| 10 | Overhaul cost rate | % | 2.5 | 2.5 |
| 11 | Employees | persons | 300 | 247 |
| 12 | Annual Salary | $10^4$RMB/person | 8 | 8 |
| 13 | Welfare rate | % | 54 | 54 |
| 14 | Insurance cost rate | % | 0.25 | 0.25 |
| 15 | Other cost | RMB/MWh | 8 | 10 |
| 16 | Pollution cost | $10^4$RMB/y | 1,366 | 1,366 |
| 17 | Water cost | RMB/MWh | 1 | 1 |
| 18 | Coal price | RMB/t | 819.12 | 819.12 |
| 19 | Coal consumption rate | gce (4) /kWh | 283.08 | 299 |
| 20 | Energy efficiency | % | 43.4 | 38.95 |

Note: (1) Data cited from the feasibility study report of the Project; (2) Data of No. 2, 3, 4,6,7,10,11, 14,15, and19 are cited from "Unit Cost Referenced Index of Fossil-fired Power Engineering and Design of 2007(UCRI)"; Coal price (No.18), salary and welfare (No. 12 and 13) are presumed as be equal with that of (1) respectively; Due to lack of comparative data in UCRI, data of No. 8,9,16, 17 are considered to be equal to that of (1) respectively. (3) P75, Project Financial Assessment Methods and Indicators (3rd edition). (4) ce: Coal Equivalent.

The total static investment used in the PDD is 7.54 billion RMB, which sourced from the approved FSR. According to the Final Financial Accounts Report of the proposed project, issued by the third-party, the actual total dynamic investment and static investment are summed as 7.94 billion RMB and 7.68 billion RMB, respectively, 0.6% and 1.9% higher than those of the estimation in the FSR .

Besides, capital expenditure per kW, as a key factor of investment analysis, is further compared with the reference value provided by Unit Cost Referenced Cost Index of Fossil-fired Power Engineering and Design (2007), which is 3724 RMB per kW for 2X1000 MW class newly built ultra-supercritical power plants at price level of 2007. The total investment of the project is 7542.27 million RMB according to the FSR, thus the capital expenditure per kW is 3771 RMB per kW, with only 1.26% variation by contrast to the reference value.

Therefore, data input from FSR can be regarded as reasonable and conservative for the investment analysis.

On the basis of the parameters and formula above, the results of LCOEP are shown in Table 6.

**Table 6. The Values of LCOEP (Unit: RMB/kWh)**

| No. of alternative | Plausible alternatives | LCOEP |
|---|---|---|
| **A1** | 2×1,000MW Ultra-supercritical | 0.3419 |

| | | |
|---|---|---|
| **A2** | 2×600MW Supercritical | 0.3249 |

When fuel price and load factor vary, the LCOEP of the two alternatives are showed in Table 7.

**Table 7. Sensitivity Analysis of LCOEP (Unit: RMB/kWh)**

| | **Fuel price variation** | | | | |
|---|---|---|---|---|---|
| | -10% | -5% | 0 | 5% | 10% |
| A1 | 0.3200 | 0.3309 | 0.3419 | 0.3529 | 0.3639 |
| A2 | 0.3005 | 0.3127 | 0.3249 | 0.3372 | 0.3494 |
| | **Load factor variation** | | | | |
| | -10% | -5% | 0 | 5% | 10% |
| A1 | 0.3781 | 0.3590 | 0.3419 | 0.3264 | 0.3123 |
| A2 | 0.3588 | 0.3410 | 0.3249 | 0.3104 | 0.2972 |
| | **Investment variation** | | | | |
| | -10% | -5% | 0 | 5% | 10% |
| A1 | 0.3337 | 0.3378 | 0.3419 | 0.3460 | 0.3501 |
| A2 | 0.3204 | 0.3227 | 0.3249 | 0.3272 | 0.3295 |
| | **O&M variation** | | | | |
| | -10% | -5% | 0 | 5% | 10% |
| A1 | 0.3379 | 0.3399 | 0.3419 | 0.3439 | 0.3459 |
| A2 | 0.3215 | 0.3232 | 0.3249 | 0.3267 | 0.3284 |

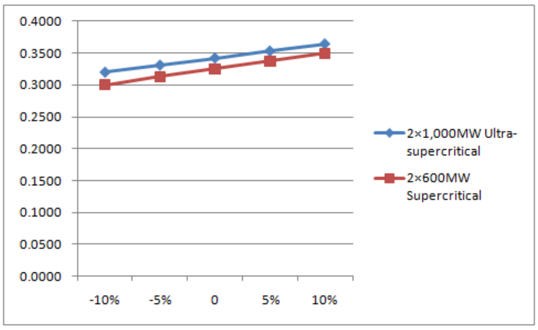



**Fig. 3 Sensitivity Analysis on Fuel price**

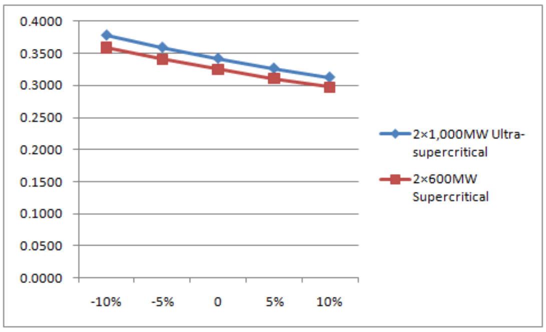



**Fig. 4 Sensitivity Analysis on Load Factor**

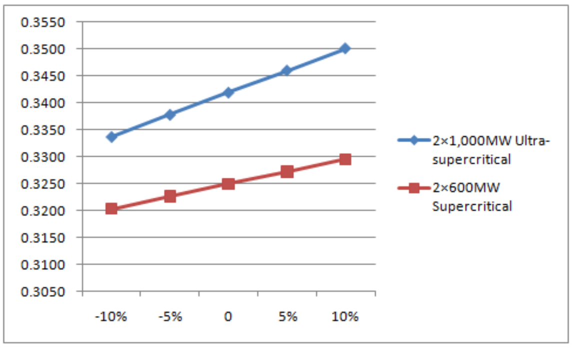



**Fig. 5 Sensitivity Analysis on Investment**

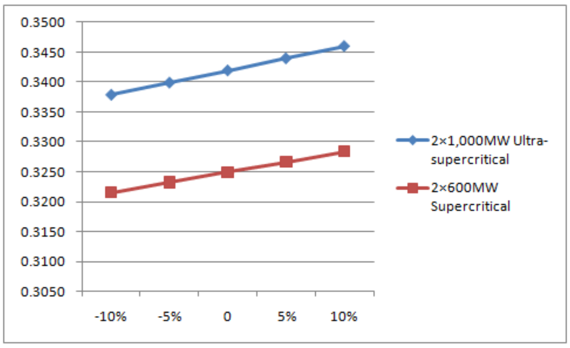



**Fig.6 Sensitivity Analysis on O& M**

Figure 3-6 show that LCOEP of super-critical 2×600MW is lower than that of the project even when fuel price, load factor, investment, and O&M vary.

The results can be confirmed by the following analysis:

**Table 8 Variation of financial indicators to make the LCOEPs of A1 and A2 the same**

| | Fuel cost | Load factor | Investment | O&M |
|---|---|---|---|---|
| **Variation of financial indicator** | ↑67% | ↑75%<br>(Load factor=1) | ↓46.5% | ↓100%<br>(O&M=0) |
| **LCOEP** | A1: 0.4890<br>A2: 0.4890 | A1: 0.2025<br>A2: 0.1942 | A1: 0.3037<br>A2: 0.3037 | A1: 0.3017<br>A2: 0.2907 |

**Fuel cost:**

The designed coal price is 819.1RMB/t. If to make LCOEPs of A1 and A2 the same, the coal price need to increase by 67%, the coal price would be up to 1,368RMB/t. As contracted in 2010, the highest coal price is 712.3RMB/t (=608.8RMB without VAT*(1+17%)), which is far below than 1,368RMB/t. Therefore, the LCOEP for the two alternatives cannot be the same by increasing the fuel cost.

**Load Factor:**

With the increase of load factor, the LCOEP for the two alternatives tend to equal. However, the load factor is at most up to 1. When load factor is equal to 1, the LCOEP for A1 is 0.2025, and the LCOEP for A2 is 0.1942. Therefore, the LCOEP for the two alternatives cannot be the same by increasing the load

factor.

**Investment:**

If to make LCOEP of the two alternatives the same, the total investment of the two alternatives need to reduce by 46.5%. The total investment of the project will drop to 4 Billion RMB from the designed 7.5 Billion RMB in FSR. As contracted, the total expenditure only on purchasing and installation of main equipments and recycled water delivery engineering has reached to 4.4 Billion RMB. Obviously, it is impossible to cut back the investment to such level. So the LCOEP for the two alternatives cannot be the same by cutting back total investment.

**Operation and Maintenance:**

With the decrease of O&M, the LCOEPs of the two alternatives tend to equal. When the O&M decrease to zero, the LCOEP of A1 is equal to 0.3017 and the LCOEP of A2 is 0.2907. It can be seen that the LCOEP for A1 is still higher than that of A2 when the O&M reduce by 100%. Therefore, the LCOEP for the A1 and A2 can not be same with variation of the O&M.

The levelized cost of electricity (LCOE) correspond to the cost of an investor assuming the certainty of production costs and the stability of electricity prices, according to its definition from Projected Costs of Generating Electricity 2010 Edition, published by International Energy Agency, which indicates that the revenues are not involved in the LCOE analysis. Nonetheless, we take the revenue from ash into consideration as an offset to O&M cost in accordance with conservative manner which the methodology requires.

For the proposed project: As there are not any related data in the FSR, we investigated the actual ash revenue from PP. According to the statement from PP, the actual ash production from December 26th, 2011 to January 15th, 2012 is 93,771 tons and the price of the ash is 9 RMB per ton. The total actual revenue of the ash is thus 843,941 RMB in 21 days at an average of daily ash production approximate 4,465 tons. We thus assume the power plant will produce 4465*365=1629725 tons per year and the revenue will be 14.67 million RMB per year, 3.68% of the total O&M cost.

For the 2*600MW supercritical power plant: We assume that the baseline scenario 2*600MW supercritical power plant uses the same type of coal whose ash proportion is 15% as the project. Meanwhile, according to Design Manual for Electric System, issued by China Electric Power Planning Institute, the ash production is estimated as 746,637 (44.8*2*8333) thousand tons per year. The revenue can be calculated as 6.72 million RMB （746,637 *9）per year, 1.97% of the total cost originally summed in LCOE.

Therefore, the potential revenue from the sale of ash covers tiny proportion of the total O&M. By taking the ash revenue into account for project and baseline scenario, the LCOE of both scenarios can be re-calculated as 0.3243 RMB/kWh and 0.3404 RMB/kWh, respectively, which means that the supercritical coal-fired power plant is still the baseline.

As a result, alternative A2 (2×600MW super-critical coal-fired power generation) is chosen to be the most likely baseline scenario of the Project activity.

**B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):**

>>
According to the suggestion of FSR, the incentive from the CDM was seriously considered in the decision to proceed with the project activity.
The FSR accomplished in November 2008 indicate that the project cannot be considered as financially attractive. Therefore, PP finally decides to seek CDM revenue in March 2009. Feasible Study Report was approved by NDRC on 25 May 2009, on which the main equipment purchasing contract became effective in accordance with agreement of article 18 of equipment contract. From the following table, the execution date of main equipment purchasing contract is the starting date of the project activity according to the latest CDM GLOSSARY term. In 2009, PP informed Chinese DNA and the UNFCCC secretariat in writing of their intention to seek CDM status, and received the response from Chinese DNA and UNFCCC on 25 June 2009 and 12 August 2009 respectively. After the validation service contract was signed in August 2009, the PDD and relevant documents were submitted to DOE for GSP.

Timeline of events and actions which have been taken to achieve CDM registration, with description of the evidence used to support these actions:

| No. | Date | Milestone |
|---|---|---|
| 1 | 06/2008 | Environmental Impact Assessment (EIA) report was finished |
| 2 | 07/11/2008 | EIA was approved by Ministry of Environmental Protection of P.R.C. |
| 3 | 11/2008 | Feasible Study Report was finished |
| 4 | 27/03/2009 | The investment decision on seeking CDM revenue |
| 5 | 25/05/2009 | FSR was approved by NDRC |
| 6 | | Execution date of Main equipment purchasing contract, which was signed on September 12, 2008 |
| 7 | 25/06/2009 | Prior Consideration of the CDM at NDRC |
| 8 | 30/06/2009 | Consultant service contract was signed |
| 9 | 12/08/2009 | Prior Consideration of the CDM at UNFCCC |
| 10 | 08/2009 | Main project construction contracts was signed |
| 11 | 27/04/2010 | ERPA was signed |
| 12 | 07/2011 | Date of commissioning (anticipated) |
| 13 | 08/2011 | Date of start-up (anticipated) |

In accordance with *Tool for the Demonstration and Assessment of Additionality* (version 05.2), the following four steps are used for demonstration and assessment of additionality.

**Step 1: Identification of alternatives to the project activity consistent with current laws and regulations**

Realistic and credible alternatives to the proposed project activity which are consistent with mandatory laws and regulations and can be part of the baseline scenario have been identified in Section B.4. The alternatives 1 and 2 are plausible baseline scenarios of the Project activity.

**Step 2: Investment Analysis**

The project proponent has performed investment analysis to establish project additionality. The investment analysis is conducted by using the following Sub-steps:

***Sub-step 2a: Determine appropriate analysis method***

Investment comparison analysis has been applied to establish additionality of the project activity.

***Sub-step 2b: Option II Apply investment comparison analysis***

As per the additionality tool, levelized cost of electricity production may be selected as a financial indicator of the project. For the project activity under consideration, levelized cost of electricity production has been identified as the most suitable financial indicator for the project type.

***Sub-step 2c: Calculation and comparison of financial indicators (only applicable to Options II and III):***

The formula and data for LCOEP calculation and the calculation result are presented in Step 2 of B.4 above. The LCOEP comparison result (see Table 6) shows that LCOEP of alternative 2 is the lowest.

***Sub-step 2d: Sensitivity analysis (only applicable to Options II and III):***

The result of sensitivity analysis is listed in Table 7 of B.4 above. When fuel price and load factor are ranging from -10% to 10%, LCOEP of alternative 2 remains the lowest.

As a result, construction of 2×600MW super-critical coal fired power units is selected as the most economically attractive alternative, and then the baseline scenario.

**Step 4: Common practice analysis**

***Sub-step 4a. Analyze other activities similar to the proposed project activity:***

As per Tool for the demonstration and assessment of additionality (version 05.2), similar activities are defined as activities that rely on a broadly similar technology or practices, are of a similar scale, take place in a comparable environment with respect to regulatory framework and are undertaken in the relevant geographical area.

Within China East Power Grid, four ultra-supercritical projects are identified from China Electric Power Yearbook 2010 (page 709-714), as follows:

| No. | Project title | CDM status[24] |
|---|---|---|
| 1 | Zhejiang Huaneng Yuhuan Ultra-supercritical Coal Fired Power Generation Project | Approved by Chinese DNA |
| 2 | Zhejiang Guodian Beilun Ultra-supercritical Power Project | At validation stage |
| 3 | Jiangsu Guodian Taizhou Ultra-supercritical Power Project | At validation stage |
| 4 | Shanghai Waigaoqiao coal-fired power project using a less GHG intensive | Registered as CDM |

According to the Tool, *those CDM project activities (registered project activities and project activities which have been published on the UNFCCC website for global stakeholder consultation as part of the validation process) are not to be included in this analysis.* Hence, only project 1, approved by Chinese DNA to seek CDM status, is considered as similar activity in this analysis.

***Sub-step 4b. Discuss any similar options that are occurring:***

[24] http://cdm.ccchina.gov.cn/web/item_new.asp?ColumnId=62, UNFCCC

As showed in the table, all similar activities within CEPG need support from CDM. Therefore, the proposed project activity is not a common practice.

## B.6. Emission reductions:

>>

### B.6.1. Explanation of methodological choices:

>>

ACM0013 (Version 04), *Tool to calculate the emission factor for an electricity system (Version 02)* and the *Chinese regional Baseline Emission Factor of new grid connected fossil fuel fired power plants using a less GHG intensive technology in 2010*[25] are applied as the following steps.

The key methodological steps are:

I. Calculating the Project Emissions ($PE_y$);

II. Calculating the Baseline Emissions ($BE_y$);

III. Calculating the Leakage Emissions ($LE_y$);

IV. Calculating the Emission Reductions ($ER_y$)

**I. Calculating the Project Emissions ($PE_y$)**

The project activity is the on-site combustion of fossil fuels in the project plant to generate electricity. Two fossil fuel categories are consumed in the project, including main fuel (coal) and auxiliary fuel (diesel). The $CO_2$ emissions from electricity generation in the project plant ( $PE_y$ ) should be calculated as follows:

$$PE_y = PE_{Coal,y} + PE_{Diesel,y} \qquad (2)$$

Where:

$PE_y$ = Project emissions in year y (tCO2)

$PE_{Coal,y}$ = Project emissions from coal consumption in year y ($tCO_2$);

$PE_{Diesel,y}$ = Project emissions from diesel consumption in year y ($tCO_2$).

**1. Project emission from main fossil fuel (coal) consumption**

According to formula (1) of ACM0013, the equitation for calculating $CO_2$ emission from the coal consumption is

$$PE_{Coal,y} = FF_{Coal,y} \times NCV_{Coal,y} \times EF_{Coal,CO2} \qquad (3)$$

Where:

$PE_{Coal,y}$ = Project emissions from coal consumption in year y ($tCO_2$);

[25] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2537

$FF_{Coal,y}$ = Quantity of fuel type i combusted in the project plant in year y (mass or volume unit/yr); According to FSR, net electricity generation is 9,470GWh, and Net Coal Consumption rate is 283.08tce/GWh. Therefore, the quality of coal consumption is 2,680,768tce/yr.

$NCV_{Coal,y}$ = Weighted average net calorific value of fuel type i in year y (GJ/mass or volume unit); As per *General principles for calculation of total production energy consumption GB2589-90*[26], $NCV_{i,y}$ is 29.307GJ/tce.

$EF_{Coal,CO2}$ = $CO_2$ emission factor of the fossil fuel type used in the project and the baseline ($tCO_2$/GJ). The 2006 IPCC default value 0.0873$tCO_2$/GJ is used[27].

**2. Project emission from auxiliary and start-up fuel (diesel) consumption**

Similar to formula (1) in ACM0013, the emission is calculated as follows:

$$PE_{Diesel,y} = FC_{Diesel,y} \times NCV_{Diesel,y} \times EF_{Diesel,CO2} \quad (4)$$

Where:

$PE_{Diesel,y}$ = Project emissions from diesel consumption in year y ($tCO_2$);

$FC_{Diesel,y}$ = Quantity of diesel combusted in the project plant in year y (mass or volume unit/yr); According to evaluation from design institution, the diesel consumption is 2,016t/yr.

$NCV_{Diesel,y}$ = Weighted average net calorific value of diesel in year y (GJ/mass or volume unit); As per China Energy Statistical Yearbook 2010(Appendix Ⅲ), $NCV_{Diesel,y}$ is 42.652GJ/tce.

$EF_{Diesel,CO2}$ = $CO_2$ emission factor of the fossil fuel type used in the project and the baseline ($tCO_2$/GJ). The IPCC default value 0.0726$tCO_2$/GJ is used[27].

**II. Calculating the Baseline Emissions ($BE_y$)**

Baseline emissions are calculated by multiplying the electricity generated in the Project ($EG_{PJ,y}$) with a baseline $CO_2$ emission factor ($EF_{BL,CO2,y}$), as follows:

$$BE_y = EG_{PJ,mail\_FF,y} \times EF_{BL,CO2} \quad (5)$$

and,

[26] http://114.255.43.243/news_view5.asp?lm2=10&id=336

[27] IPCC default value of coal at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories

$$EG_{PJ,main\_FF,y} = EG_{PJ,y} \times \left[ \frac{\sum_p (FC_{p,y} \cdot NCV_{p,y})}{\sum_p (FC_{p,y} \cdot NCV_{p,y}) + \sum_q (FC_{q,y} \cdot NCV_{q,y})} \right] \quad (6)$$

Where:

$BE_y$ = Baseline emissions in year *y* ($tCO_2$)

$EG_{PJ,mail\_FF,y}$ = Net quantity of electricity generated in the project plant from using fossil fuel types within the main fossil fuel category in year *y* (MWh)

$EG_{PJ,y}$ = Total net quantity of electricity generated in the project plant in year *y* (MWh)

$EF_{BL,CO2}$ = Baseline emission factor ($tCO_2$/MWh)

$FC_{p,y}$ = Quantity of fossil fuel type *p* consumed by the project plant in year *y* (Mass or volume unit)

$NCV_{p,y}$ = Average net calorific value of the fossil fuel type *p* consumed by the project plant in year *y* (GJ/Mass or volume unit)

$FC_{q,y}$ = Quantity of fossil fuel type *q* consumed by the project plant in year *y* (Mass or volume unit)

$NCV_{q,y}$ = Average net calorific value of the fossil fuel type *q* consumed by the project plant in year *y* (GJ/Mass or volume unit)

p = Fossil fuel types that are used in the project plant and that belong to the main fossil fuel category

q = Fossil fuel types that are used in the project plant for auxiliary and start-up purposes

**Option 1**: The emission factor ($tCO_2$/MWh) of the best baseline scenario (2×600MW sub-critical coal-fired power generation technology) identified under section B.4 above, and calculated as follows:

$$EF_{BL,CO2} = 3.6 \cdot \frac{MIN(EF_{FF,BL,CO2}; EF_{FF,CO2})}{\eta_{BL}} \quad (7)$$

Where:

$EF_{BL,CO2}$ = Baseline emission factor ($tCO_2$/MWh)

$EF_{FF,BL,CO2}$ = $CO_2$ baseline emission factor of 2×600MW supercritical power generation ($tCO_2$ /GJ)

$EF_{FF,CO2}$ = $CO_2$ emission factor of the fossil fuel type used in the project and the baseline ($tCO_2$ /GJ)

$\eta_{BL}$ = Energy efficiency of 2×600MW sub-critical power generation identified as the most likely baseline scenario

3.6 = Unit conversion factor from GJ to MWh

According to ACM0013 (Version 04), $EF_{FF,BL,CO2}$ is 0.0873 $tCO_2$/GJ (IPCC default value of coal at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories). $EF_{FF,CO2}$=$EF_{coal,CO2}$（Step I）

=0.0873t$CO_2$/GJ.

The $\eta_{BL}$ is calculated based on the Coal Consumption per kWh for Power Supplied to Grid of baseline (2*600MW sup-critical coal-fired power generation technology), the calculation formula is similar to formula (6) of ACM0013, as follows:

$\eta_{BL} = 3.6 \cdot \frac{EG}{FC \cdot NCV}$ =3.6MJ/kWh*1kWh/ (315.4gce*0.029307MJ/gce)=38.95%, of which:

0.02930 MJ/gce is net calorific value of coal equivalent (also called standard coal in China). 315.4 is Net Coal Consumption Rate, which is calculated according to the Gross Coal Consumption Rate (299gce/kWh) and the plant electricity self-consumption rate (5.20%)[28], 299(gce/kWh)/(1-5.20%)=315.4(gce/kWh).

**Option 2**: The average emissions intensity of all the power plants whose performance is among the top 15% of their category, using data from the reference year *v* (Year 2008) as follows:

$$EF_{BL,CO2} = \frac{\sum_j FC_j \cdot NCV_j \cdot EF_{FF,CO2}}{\sum_j EG_j} \qquad (8)$$

where

$EF_{BL,CO2}$ = Baseline emission factor (t$CO_2$/MWh)

$FC_j$ = Amount of fuel consumed by power plant j in the reference year *v* (Mass or volume unit)

$NCV_j$ = Average net calorific value of the fossil fuel type consumed by power plant j in the reference year *v* (GJ/Mass or volume unit)

$EF_{FF,CO2}$ = $CO_2$ emission factor of the fossil fuel type used in the project and the baseline (t$CO_2$/GJ)

$EG_j$ = Net electricity generated and delivered to the grid by power plant j in the reference year *v* (MWh)

j = The top 15% performing power plants (excluding cogeneration plants and including power plants registered as CDM project activities), as identified below, among all power plants in a defined geographical area that have a similar size, are operated at similar load and use a fuel type within the same fuel category as the project activity.

The following step-wise approach is used for determination of the top 15% performing power plants.

***Step 1: Definition of similar plants to the project activity***

The sample group of similar power plants should consist of all power plants (except for cogeneration power plants):

---

[28] Unit Cost Referenced index of Fossil-fired Power Engineering and Design of 2007, compiled by Electric Power Planning and Design Institute and published by China Electric Power Press in 2008

1) That use the same fossil fuel category as the project activity. This should include power plants which use small amounts of fuels within another fossil fuel category than the main fuel for start-up or auxiliary purposes, but these other fuels shall not comprise more than 3% of the total fuel used annually by the sample power plant on an energy basis;

2) That have been constructed in the previous five years, where the last year of this 5 years period should be the reference year *v*;

3) That have a comparable size to the Project activity, defined from 50% to 150% of the installed capacity of the Project;

4) That are operated in the same load category, i.e. base load of more than 3000 hours per year or base load (defined as a load factor of more than 3,000 hours per year) as the project activity; and

5) That are operated (supplied electricity to the grid) in the reference year *v*.

***Step 2: Definition of the geographical area***

The grid to which the Project will be connected is used for the geographical area and the number of power plants "N" in the sample group comprises at least 10 plants in the area. If the number of similar plants, as defined in **Step 1**, within the grid boundary is less than 10, the geographical area should be extended to the country. If the number of similar plants is still less than 10, the geographical area should be extended by including all neighboring non-Annex I countries and even all non-Annex I countries, Annex I or OECD countries on the analogy of this.

***Step 3: Identification of the sample group***

Identify all power plants n that are to be included in the sample group. The total number "N" of all power plants identified should be counted within the geographical area, as defined in **Step 2** above. The sample group should also include all power plants within the geographical area registered as CDM project activities, which meet the criteria defined in **Step 1** above.

***Step 4: Determination of the plant efficiencies***

The most recent one-year data available is used to calculate the operational efficiency of each power plant n in the sample group identified in **Step 3** above, as follows:

$$\eta_{n,v} = 3.6 \cdot \frac{EG_{n,v}}{FC_{n,v} \cdot NCV_{n,v}} \qquad (9)$$

Where:

$\eta_{n,v}$ = Operational efficiency of the power plant n in the reference year *v*;

$EG_{n,v}$ =Net electricity generated and delivered to the grid by the power plant n in the reference year *v* (MWh);

$FC_{n,v}$ = Quantity of fuel consumed in the power plant n in the reference year *v* (Mass or volume unit);

$NCV_{n,v}$ = Average net calorific value of the fuel type fired in power plant n in the reference year *v*

(GJ/mass or volume unit);

3.6 = Unit conversion factor from GJ to MWh

$V$ = Reference year $v$

n = All power plants in the defined geographical area that have a similar size, are operated at similar load and use a fuel type within the same fuel category as the project activity

***Step 5: Identification of the top 15% performer plants j***

Align the sample group of N plants in a decreasing order of the operational efficiency. Identify the top performer plants j, where the J (the total number of plants j) is 15% (rounded down if it is decimal) of N (the total number of plants n identified in **Step 3**). If the generation of plants j (the top performers) is less than 15% of the total generation of all plants n (the whole sample group), then the number of plants j included in the top performer group should be enlarged until the group represents at least 15% of total generation of all plants n.

All steps have been documented transparently including a list of the plants identified in **Steps 3** and **5**, as well as relevant data on the fuel consumption and electricity generation of all identified power plants.

According to official material published by China DNA[29], for Option 2, the $EF_{BL,CO2}$ for 1,000MW is 0.7613 $tCO_2/MWh$.

### III. Calculating the Leakage Emissions ($LE_y$)

No leakage emissions are to be considered for the Project according to ACM0013 (version 04).

### IV. Calculating the Emission Reduction ( $ER_y$ )

To calculate the emission reductions the project participant shall apply the following equation:

$$ER_y = BE_y - PE_y \qquad (10)$$

Where:

$ER_y$ = Emission reductions in year y ($tCO_2$)

$BE_y$ = Baseline emissions in year y ($tCO_2$)

$PE_y$ = Project emissions in year y ($tCO_2$)

**B.6.2. Data and parameters that are available at validation:**

>>

| **Data / Parameter:** | $EF_{coal,BL,CO2}$ |
|---|---|
| Data unit: | $tCO_2/GJ$ |
| Description: | Fuel coal $CO_2$ emission factor for super-critical coal-fired power generation technology |

[29] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2330.pdf

| | |
|---|---|
| | which is identified as the most likely baseline scenario |
| Source of data used: | IPCC default value of coal at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories |
| Value applied: | 0.0873 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Official statistical data |
| Any comment: | - |

| **Data / Parameter:** | $\eta_{BL}$ |
|---|---|
| Data unit: | % |
| Description: | Energy efficiency of baseline domestic super-critical power generation which is identified as the most likely baseline scenario |
| Source of data used: | data calculation |
| Value applied: | 38.95 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Data for calculation are annual electricity generation supplied to CEPG, annual fuel consumption, and NCV of coal of baseline scenario super-critical power generation technology.<br>The appropriateness of the data should be available and comparable for baseline scenario and the project at the same time point when the investment decision was made. Based on this consideration, the parameters used for baseline scenario selection procedure are sourced from Unit Cost Referenced Index of Fossil-fired Power Engineering and Design of 2007. So the energy efficiency of the power generation technology that has been identified as the most likely baseline scenario is calculated as 38.95% in the PDD, and while according to 2009 Bulletin on determining baseline emission factor for China Grid", published on July 2nd, 2009， the best commercial energy efficiency for the 600 MW units estimated to be 38.10% in the year of 2007. The energy efficiency used in the PDD (38.95%) is 2.2% higher than the best commercial energy efficiency. |
| Any comment: | As a conservative approach, the efficiency should be determined as the efficiency at optimum load, e.g., as provided by the manufacturers |

| **Data / Parameter:** | $FC_{j,x}$ and $FC_{n,v}$ |
|---|---|
| Data unit: | tce/yr |
| Description: | Amount of coal consumed by power plant j or n in the reference year v, where:<br>• j are the top 15% performer plants among all power plants in a defined geographical area that have a similar size, are operated at similar load and use a fuel type within the same fuel category as the project activity and any technology available within the geographical area, as defined in Step 2 under “Baseline emissions” section<br>• n are all power plants (including power plants registered as CDM project activities) in the defined geographical area that have a similar size, are operated at similar load and use a fuel type within the same fuel category as the project activity and any technology available within the geographical area, as defined in Step 2 under “Baseline emissions” section |
| Source of data used: | Statistics by China Electricity Council |
| Value applied: | See “Chinese regional Baseline Emission Factor of new grid connected fossil fuel fired power plants using a less GHG intensive technology in 2010” issued by China DNA |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Official statistical data |
| Any comment: | - |

| **Data / Parameter:** | $NCV_j$；$NCV_{n,v}$ |
|---|---|
| Data unit: | GJ/t |

| | |
|---|---|
| Description: | Average net calorific value of the fossil fuel type consumed by power plant j or n in the reference year *v*, where:<br>• j are the top 15% performer plants among all power plants in a defined geographical area that have a similar size, are operated at similar load and use a fuel type within the same fuel category as the project activity and any technology available within the geographical area, as defined in Step 2 under "Baseline emissions" section<br>• n are all power plants (including power plants registered as CDM project activities) in the defined geographical area that have a similar size, are operated at similar load and use a fuel type within the same fuel category as the project activity and any technology available within the geographical area, as defined in Step 2 under "Baseline emissions" section |
| Source of data used: | China Energy Statistical Yearbook 2009 |
| Value applied: | See "Chinese regional Baseline Emission Factor of new grid connected fossil fuel fired power plants using a less GHG intensive technology in 2009" issued by China DNA |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Official statistical data |
| Any comment: | - |

| **Data / Parameter:** | $EF_{coal,CO2}$ |
|---|---|
| Data unit: | $tCO_2/GJ$ |
| Description: | $CO_2$ emission factor of the fossil fuel type used in the project and the baseline |
| Source of data used: | IPCC default value of coal at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories |
| Value applied: | See "Chinese regional Baseline Emission Factor of new grid connected fossil fuel fired power plants using a less GHG intensive technology in 2010" issued by China DNA |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Official statistical data |
| Any comment: | - |

| **Data / Parameter:** | $EG_j$ and $EG_{n,v}$ |
|---|---|
| Data unit: | MWh |
| Description: | Net electricity generated and delivered to the grid by power plant j or n in the reference year *v*, where:<br>• j are the top 15% performer plants among all power plants in a defined geographical area that have a similar size, are operated at similar load and use a fuel type within the same fuel category as the project activity and any technology available within the geographical area, as defined in Step 2 under "Baseline emissions" section;<br>• n are all power plants (including power plants registered as CDM project activities) in the defined geographical area that have a similar size, are operated at similar load and use a fuel type within the same fuel category as the project activity and any technology available within the geographical area, as defined in Step 2 under "Baseline emissions" section |
| Source of data used: | Statistics by China Electricity Council |
| Value applied: | See "Chinese regional Baseline Emission Factor of new grid connected fossil fuel fired power plants using a less GHG intensive technology in 2010" issued by China DNA |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Official statistical data |
| Any comment: | - |

**B.6.3. Ex-ante calculation of emission reductions:**

>>

### I. Calculate $CO_2$ emission from the Project

The calculation result is as below based on formula (2), (3), (4), (5) in B.6.1 above:

$PE_y = PE_{Coal,y} + PE_{Diesel,y}$ =6,858,747+6,243=6,864,989($tCO_2$)

### II. Calculate $CO_2$ emission from the baseline scenario

**(1) Determine $EF_{BL,CO2,y}$**

**Option 1**: The emission factor ($tCO_2$/MWh) of the most likely baseline scenario (2×600MW supercritical coal-fired power generation technology)

The calculation result is as below based on formula (6) in B.6.1 above:

| Parameter | $EF_{FF,BL,CO2}$ | $EF_{FF,CO2}$ | $\eta_{BL}$ | | $EF_{BL,CO2}$ |
|---|---|---|---|---|---|
| Unit | $tCO_2$/GJ | $tCO_2$/GJ | - | GJ/MWh | $tCO_2$/MWh |
| Value | 0.0873 | 0.0873 | 38.95% | 3.6 | 0.8070 |

**Option 2**: The average emissions intensity of all the power plants whose performance is among the top 15% of their category

On the basis of "*Chinese regional Baseline Emission Factor of new grid connected fossil fuel fired power plants using a less GHG intensive technology in 2010*" issued by China DNA, the average emission factor for the top 15% performing power plants of the CEPG is 0.7613 $tCO_2$/MWh.

The result 0.8070 $tCO_2$/MWh of option 1 is higher than that 0.7613$tCO_2$/MWh of option 2 by comparison and thus the former is taken for the Project i.e. $EF_{BL,CO2}$=0.7613 ($tCO_2$/MWh).

**(2) Calculate $CO_2$ emission from the baseline scenario**

| Parameter | $EG_{PJ,y}$ | $EG_{PJ,main\_FF,y}$ | $EF_{BL,CO2}$ | $BE_y$ |
|---|---|---|---|---|
| Unit | MWh/yr | MWh/yr | $tCO_2$/MWh | $tCO_2$/yr |
| Value | 94,700,000 | 9,459,647 | 0.7613 | 7,201,629 |

The calculation result is as below based on formula (5) in B.6.1 above:

### III. Leakage Emission

$LE_y$=0.

### IV. Calculate emission reduction

The calculation result is as below based on formula (10) in B.6.1 above:

| Parameter | $BE_y$ | $PE_y$ | $LE_y$ | $ER_y$ |
|---|---|---|---|---|
| Unit | $tCO_2$/yr | $tCO_2$/yr | $tCO_2$/yr | $tCO_2$/yr |
| Value | 7,201,629 | 6,864,989 | 0 | 336,640 |

### B.6.4. Summary of the ex-ante estimation of emission reductions:

>>

| Year | Estimation of project activity emissions (tonnes of $CO_2e$) | Estimation of baseline emissions (tonnes of $CO_2e$) | Estimation of leakage (tonnes of $CO_2e$) | Estimation of overall emission reductions (tonnes of $CO_2e$) |
|---|---|---|---|---|
| 01/07/2011~31/12/2011 | 3,432,495 | 3,600,815 | 0 | 168,320 |
| 01/01/2012~31/12/2012 | 6,864,989 | 7,201,629 | 0 | 336,640 |
| 01/01/2013~31/12/2013 | 6,864,989 | 7,201,629 | 0 | 336,640 |
| 01/01/2014~31/12/2014 | 6,864,989 | 7,201,629 | 0 | 336,640 |
| 01/01/2015~31/12/2015 | 6,864,989 | 7,201,629 | 0 | 336,640 |
| 01/01/2016~31/12/2016 | 6,864,989 | 7,201,629 | 0 | 336,640 |
| 01/01/2017~31/12/2017 | 6,864,989 | 7,201,629 | 0 | 336,640 |
| 01/01/2018~31/12/2018 | 6,864,989 | 7,201,629 | 0 | 336,640 |
| 01/01/2019~31/12/2019 | 6,864,989 | 7,201,629 | 0 | 336,640 |
| 01/01/2020~31/12/2020 | 6,864,989 | 7,201,629 | 0 | 336,640 |
| 01/01/2021~31/06/2021 | 3,432,495 | 3,600,815 | 0 | 168,320 |
| Total ($tCO_2e$) | 68,649,890 | 72,079,460 | 0 | 3,366,400 |

## B.7. Application of the monitoring methodology and description of the monitoring plan:

>>

### B.7.1. Data and parameters monitored:

>>

| Data / Parameter: | $EG_{PJ,y}$ |
|---|---|
| Data unit: | MWh |
| Description: | Total net quantity of electricity generated in the project plant and fed into the grid in year y |
| Source of data to be used: | Electricity meter readings |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 9,470,000 |
| Description of measurement methods and procedures to be applied: | The electricity will be measured hourly and recorded monthly by meters with accuracy of no lower than 0.5s. The electricity meters will be calibrated and checked quarterly according to national standard (DL/T448 – 2000). Data will be kept at the control centre using a computer system. |
| Monitoring frequency: | Continuously |
| QA/QC procedures to be applied: | The metered net electricity generation should be cross-checked with receipts from sales. |
| Any comment: | - |

| Data / Parameter: | $FC_{coal,y}$ |
|---|---|
| Data unit: | t/yr |
| Description: | Quantity of coal consumed by the project plant in year y |
| Source of data to be used: | Readings of Electronic belt scales |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 3,753,000 (2,680,768tce) |
| Description of measurement methods and procedures to be applied: | Electronic belt scale will be used to weigh coal consumption. The electronic belt scale will be annually calibrated and checked according to JJG02-96. |
| Monitoring frequency: | Continuously |
| QA/QC procedures to be applied: | The consistency of metered fuel consumption quantities should be cross-checked by an annual energy balance that is based on purchased quantities and stock changes. Where the purchased fuel invoices can be identified specifically for the CDM project, the metered fuel consumption quantities should also be cross-checked with available purchase invoices from the financial record. Keep coal consumption data recorded by the staff |

| | |
|---|---|
| | and coal purchase invoices. |
| Any comment: | Coal is the main fossil fuel category. |

| | |
|---|---|
| **Data / Parameter:** | $FC_{diesel,y}$ |
| Data unit: | t/yr |
| Description: | Quantity of diesel oil consumed by the project plant in year y |
| Source of data to be used: | Readings of flow meter |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 2,016 |
| Description of measurement methods and procedures to be applied: | Quantity of diesel oil consumed will be measured by flow meter, which will be annually calibrated and checked according to JJG897. |
| Monitoring frequency: | Continuously |
| QA/QC procedures to be applied: | The consistency of metered fuel consumption quantities should be cross-checked by an annual energy balance that is based on purchased quantities and stock changes. Where the purchased fuel invoices can be identified specifically for the CDM project, the metered fuel consumption quantities should also be cross-checked with available purchase invoices from the financial record. Keep diesel oil consumption data recorded by the staff and diesel purchase invoices. |
| Any comment: | The diesel oil is auxiliary and start-up fuel. |

| | |
|---|---|
| **Data / Parameter:** | $NCV_{coal,y}$ |
| Data unit: | GJ/t |
| Description: | Weighted average net calorific value of coal consumed by the project plant in year y |
| Source of data to be used: | The following data sources may be used if the relevant conditions apply: |

| **Data source** | **Conditions for using the data source** |
|---|---|
| (a) Values provided by the fuel supplier in invoices | This is the preferred source if the carbon fraction of the fuel is not provided |
| (b) Measurements by the project participants | If (a) is not available |
| (c) Regional or national default Values | If (a) is not available<br>These sources can only be used for liquid fuels and should be based on well documented, reliable sources (such as national energy balances). |
| (d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories | If (a) is not available |

| | |
|---|---|
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 29.307GJ/tce(China Energy Statistical Yearbook 2010) |
| Description of measurement methods and procedures to be applied: | For (a) and (b): Measurements should be undertaken in line with national or international fuel standards |
| Monitoring frequency: | For (a) and (b): The NCV should be obtained for each fuel delivery, from which weighted average annual values should be calculated<br>For (c): Review appropriateness of the values annually<br>For (d): Any future revision of the IPCC Guidelines should be taken into account |
| QA/QC procedures to be applied: | Verify if the values are within the uncertainty range of the IPCC default |

| | |
|---|---|
| | values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories should have ISO17025 accreditation or justify that they can comply with similar quality standards. |
| Any comment: | - |

| **Data / Parameter:** | $NCV_{diesel,y}$ |
|---|---|
| Data unit: | GJ/t |
| Description: | Weighted average net calorific value of diesel consumed by the project plant in year y |
| Source of data to be used: | Values provided by the fuel supplier |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 42.652 (China Energy Statistical Yearbook 2010) |
| Description of measurement methods and procedures to be applied: | Measurements should be undertaken in line with national or international fuel standards |
| Monitoring frequency: | Review appropriateness of the values annually |
| QA/QC procedures to be applied: | Verify if the values are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories should have ISO17025 accreditation or justify that they can comply with similar quality standards. |
| Any comment: | The diesel is auxiliary and start-up fuel. |

### B.7.2. Description of the monitoring plan:

>>

The monitoring plan is prepared in order to guarantee acquiring true, measurable and long-term GHG emission reduction effect.

**1. Monitored parameter**

The main data and parameters to be monitored during operation period are electricity supplied to the grid, coal consumption in the project plant, and average net calorific value of coal, of which the details are described as below.

(1) Monitoring of net electricity supplied to the grid by the Project

This data will be obtained by reading electronic meters. Two bidirectional meters (Main meter and backup meter) are equipped at outlet of the power transmission line of the step-up substation. The backup meter is used to measure the output electricity in case the main meter fails. The net electricity is equal to the electricity delivered to the grid minus the electricity imported from the grid. The accuracy degree of the two meters is no lower than 0.5S. Electricity meters will be measured hourly and recorded monthly. Data will be kept at the control centre using a computer system. The readings recorded should be easily available for DOE verification as well as calibration, measurement and maintenance documentation of relevant measuring apparatus.

(2) Monitoring of coal combusted by the Project

The main fossil fuel (coal) to be combusted will also be weighed by electronic belt scales before it goes into the burner. Two electronic belt scales will be equipped on two belt conveyors respectively. Generally, only one belt conveyor is used to convey coal for two boilers. Another is only used when the one is out of order. The summation of recordings of the two electronic belt scales will be used to count coal

consumption. When the electronic belt scale does not work normally or its allowable error is out of reasonable ranges, coal consumption is subject to the difference value between amounts of coal carried into the power plant and coal stock. The readings recorded should be easily available for DOE verification as well as calibration, measurement and maintenance documentation of relevant measuring apparatus.

(3) Monitoring of average net calorific value of coal

If the NCV of coal need to be measured by project participant, the laboratory for testing coal entering the burner will take samples automatically and analyze samples to measure the average net calorific value. The NCV should be obtained for each fuel delivery, from which weighted average annual values should be calculated. The measurement records should be easily available for DOE verification as well as calibration, measurement and maintenance documentation of relevant measuring apparatus.

(4) Monitoring of quantity of diesel oil combusted by the Project

The auxiliary and start-up fuel (diesel) combusted by the Project is measured by flow meter. The measurement data recorded and purchased fuel invoices should be easily available for DOE verification.

(5) Monitoring of average net calorific value of diesel

NCV of diesel should be supplied by diesel supplier. If it is not available, national default NCV of diesel is applied. The appropriateness of the values is reviewed annually.

**2. Quality Assurance and Quality Control**

All the monitoring instruments applied in the Project shall meet the measurement accuracy and shall be subject to regular maintenance and testing regime to ensure accuracy by a certified third calibration party. The project participants shall keep and provide the certifications of the third calibration party.

Data and records will be checked prior to being recorded and archived, and possible errors would be identified during this step.

In case of emergencies, the project owner will not claim emission reductions due to the project activity for the duration of emergency.

In case the meter operates abnormally, the readings from the back up meters will be used. If the back up meter is not within acceptable limits of accuracy or performed improperly, the proposed project owner and the grid company shall jointly prepare a new agreement of the correct readings.

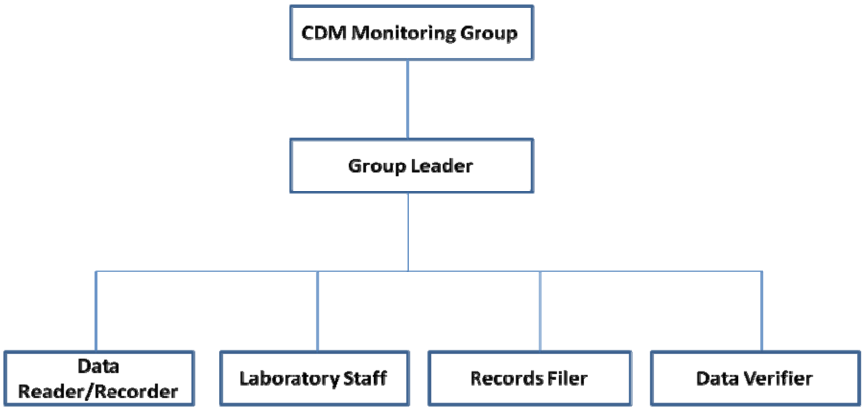
Training on CDM monitoring will be provided to the relevant staff to guarantee the success of the implementation of the monitoring plan.

**3. Disposal of urgency**

Disposal of urgency will be implemented according to the stipulations in the Management Regulations on the Settlement of Electricity Purchase of Electric Power Company, and so on.

**4. Institution and responsibility**

This monitoring plan for the Project activity will be implemented by the Project owner. The institutional framework is shown in the below.




The responsibilities of the sections are briefly described as following:

Group leader: Manage the work of CDM Monitoring Group; In charge of all relevant matters with the monitoring activity.

Data reader/recorder: Collect the data according to the Monitoring Plan.

Laboratory staff: Measure average net calorific value per mass or volume unit of coal according to GB/T213 Determination of calorific value of coal.

Records filer: Keep and archive data that collected electronically; Collect and keep textual information, invoice of coal purchasing, and invoice of electricity sales, etc.

Data verifier: Audit the monitoring data and execute the QC/QA procedures according to the Monitoring Plan.

**5. Installation of measuring equipments**

In order to ensure accuracy of metering equipment, metering manufacture license and metering quality guarantee certificate should be required for all the equipment. The metering equipment will be properly installed, configured and checked in line with relevant national standards and trade standards.

Electricity energy is measured by using of electric meters, which are installed in compliance with electric industrial standard of DL/T448-2000 Technical administrative code of electric energy metering. The electronic belt scale should be installed according to relevant national or regional standard.

**6. Calibration**

Error resulting from such metering equipment should not exceed requirements from national or trade standards. The metering equipments will be calibrated and checked annually for accuracy by the certain organization according to the agreement between the relevant companies, requirements from national and local regulations. The calibrations for measurement equipment will be implemented as B.7.1.

**7. Data collection, internal audit and management**

Monitoring work is in general control of CDM group leader and detailed work should be done by professionals. The designated staff should collect and summarize associated monitoring data and prepare

a report monthly on the operations of the CDM project activity. This report will record data readings and equipment defects, outages, repairs and maintenance activities. All relevant information, data files, maintenance records, defect reports, hard copy and computerized records of monitoring and electricity sales and coal purchase invoices will be kept at the control centre and files department, and arranged in an orderly and transparent manner to facilitate audit as and when required.

Monitored data will be reviewed by responsible personnel according to management procedures in the monitoring plan. This internal audit will also identify potential improvements to the management procedures to improve monitoring and reporting in future years. If such improvements are proposed these will be reported to the DOE and only operated after approval from the DOE.

Physical documentation such as paper-based maps, diagrams and environmental assessment will be collected in a central place, together with this monitoring plan. In order to facilitate auditor's reference, monitoring results will be indexed. All paper-based information will be stored by the CDM team and kept at least one copy. The data monitored and required for verification and issuance are to be kept for two years after the end of the crediting period or the last issuance of CERs for the Project activity, whatever occurs later.

**8. Verification of monitoring results**

The verification of the monitoring results of the Project activity is a mandatory process required for all CDM projects. The main objective of the verification is to independently verify that the Project has achieved the emission reductions as reported and projected in the PDD. It is expected that the verification will be done annually.

The responsibilities for verification of the projects are as follows:

(1) CDM group leader will take charge of the arrangements for the verification and will prepare for the audit and verification process to the best of his/her abilities.

(2) CDM group leader will provide the DOE with all required necessary information, before, during and, in the event of queries, after the verification due to facilitate verification.

(3) CDM group leader will fully cooperate with the DOE, instruct other relevant staff, management to be available for interviews and respond honestly to all questions from the DOE.

**B.8. Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)**

>>

Date of completion: 09/09/2010

Name of persons determining the baseline study and monitoring methodology:

Ms. Zhou Ruixia China Carbon Technology Co., Ltd., Tel: +86 10 66574169 E-mail: rx_zhou@china-carbon.cn

Miss. Lv Xin China Carbon Technology Co., Ltd., Tel: +86 10 66574169 E-mail: lvxin@china-carbon.cn

Ms. Huang Jinfeng China Carbon Technology Co., Ltd., Tel: +86 10 66574169 E-mail: jinfeng@china-carbon.cn

Mr. Du Wenjun China Carbon Technology Co., Ltd., Tel: +86 10 66574169 E-mail: durward@china-carbon.cn

None of them is the participant.

## SECTION C. Duration of the project activity / Crediting period

### C.1. Duration of the project activity:

#### C.1.1. Starting date of the project activity:

>>

25/05/2009, the earliest date when main equipment purchasing contract became effective is chosen to be the starting date of the project activity.

#### C.1.2. Expected operational lifetime of the project activity:

>>

20 years 0 month

### C.2. Choice of the crediting period and related information:

>>

#### C.2.1. Renewable crediting period

>>

##### C.2.1.1. Starting date of the first crediting period:

>>

Not applicable.

##### C.2.1.2. Length of the first crediting period:

>>

Not applicable.

#### C.2.2. Fixed crediting period:

>>

##### C.2.2.1. Starting date:

>>

01/07/2011. This is an expected date. If it is earlier than the registration date, then the registration date would be the starting date of the first crediting period.

##### C.2.2.2. Length:

>>

10 years 0 month

## SECTION D. Environmental impacts

### D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

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The Environmental Impact Assessment (EIA) of the Project was approved by the Ministry of Environmental Protection of China on Nov. 7th, 2008.

According to the Feasibility Study Report and the Environmental Impact Assessment Report, environmental impacts possibly caused by the proposed project and protective measures adopted by the project owner are analyzed as follows:

**I. Air impact and mitigation measures**

(1) During construction period

Air impacts during construction period are mostly incurred by dust particles produced by construction machines operation and vehicle transportation. In order to mitigate efficiently impacts on ambient air incurred by the Project construction, the detail environmental requirements on construction are put forward and include the following points: farinose materials should not be piled up too high; minimize windward area of piled materials; spray water onto materials surface; cover stones, soils and other construction materials when they are carried by vehicles and use specific enclosed vehicles when necessary; strengthen control and supervision upon construction sites, equip the sites with enclosure and cover the sites with cloth and so on.

(2) During operation period

The fuel coal of the Project in operation produces principally $SO_2$, NOx and flue gas. To mitigate emission of $SO_2$, some measures to be taken include using low sulphur content coal and making flue gas desulphurization. Low- NOx burning technology is employed to reduce emission of NOx. The prevention and control measures for flue gas dust are to use electrostatic precipitators and wet desulphurization dedusting. Once the above measures are carried out, the concentrations of $SO_2$, NOx and flue gas dust will all meet the requirement of GB13223-2003 Emission standard of air pollutants for thermal power plants.

In addition, the ash yard, the coal yard and the dock will bring fugitive dust pollution when they are put into operation. However, dust emission can be abated and secondary contamination of fugitive dust can be mitigated if the following steps are implemented such as sprinkling and water spraying, planting trees around and equipping the conveyor at the dock with close covers and dedusting system.

**II. Water impact and mitigation measures**

(1) During construction period

Impacts on waters during construction of the Project come primarily from drain of construction sites, drain of equipment cleaning and sewage of construction persons. The drain of construction sites must be defecated and then discharged; flushing of machines and vehicles should be done at fixed places with no waste water discharged everywhere and every time; the small amount of oily water from machine erection will be treated in separation tank; sewage of construction persons will be treated by existing sewage

treatment facility in the power plant. Thus impacts on waters incurred by the waste water can be minimized during construction period.

(2) During operation period

Wastewater during operation period is mostly composed of production wastewater and sewage. All of the wastewater will be treated by wastewater treatment facility and will be reutilized.

**III. Noise impact and mitigation measures**

(1) During construction period

Construction noise results chiefly from construction machines and vehicles. The closest inhabitant location is more than 200m far from the construction site; in order to mitigate noise impacts on the residents, it is firstly prohibited that a few of construction machines with over 100dB(A) level be operated synchronously and if several machines will be run at the same time, it must happen in the daytime.

(2) During operation period

When the Project is put into service, the main dynamical equipment such as generators, steam turbines, blower fans, air compressors, coal pulverizer and pumps will all make noise. Noise impacts will be depressed effectively if the measures are implemented including fixing sound insulation covers and mufflers, making anti-vibration foundation and planting trees.

**IV. Solid waste impact and mitigation measures**

(1) During construction period

There will be a mass of building rubbish and domestic garbage during construction period. Construction soils and rubbish, except those possessing value in use to be recycled, should be cleared in time and carried away to the designated site for disposition or landfill. The domestic garbage will be collected and cleared together. Solid wastes will not incur serious impacts on surroundings as long as effective management and measures are carried out.

(2) During operation period

The ash and slugs generated by the Project will be sold to concrete manufactures for comprehensive utilization.

Living quarter in the power plant will bring domestic garbage. And solid wastes at the dock will come from the shipping and the land area around. Solid wastes will create little impacts on surroundings when they are gathered together and transmitted to the municipal rubbish disposal site. Solid wastes will not incur serious impacts on the environment.

**V. Ecological impact**

Verdurization and reclamation will be carried out to increase vegetation coverage and restore the vegetation after the competition of the Project. The Project on the ecological environment is considered to be significant.

**D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:**

>>

When a series of mitigation measures dealing with various environmental impacts is carried out, the environmental impacts are not significant during either construction or operation periods.

## SECTION E. Stakeholders' comments

>>

**E.1. Brief description how comments by local stakeholders have been invited and compiled:**

>>

In June 2009, totally 30 questionnaires were distributed to the villagers to better understand stakeholders' comments by the Project owners. The information of the proposed project was provided to the villagers, including the issues on the site, capacity, estimated amount of feed-in electricity etc. The content of the questionnaire includes the following information:

1. What do you think about the current environment quality? (Very good, Good, Bad)

2. How much do you know about the proposed project?(Never, A little, Very much)

3. Do you satisfy with local electricity supply? (No, Yes)

4. What's the influence will be caused by the implementation of the Project? (Improve the local electricity supply; Improve the local economic development; Increase job opportunities; Improve the utilization of natural resource; Noise and Water pollution; Influence the plant and eco-system)

5. What's the effect to your daily life and environment by proposed project? (Negative, Not effect, Positive)

6. Do you support the proposed project? (Yes, No)

The following is the summarized background information of the residents:

| | | |
|---|---|---|
| **Gender** | Male | 16 |
| | Female | 14 |
| **Education** | Elementary school | 10 |
| | High school | 12 |
| | Collage/university | 8 |
| **Occupation** | Cadre | 2 |
| | Worker | 4 |
| | Farmer | 18 |
| | Teacher | 1 |
| | Student | 3 |
| | Others | 2 |

**E.2. Summary of the comments received:**

>>

The Survey was conducted through distributing and collecting responses to a questionnaire. Totally 30 questionnaires returned out of 30 with 100% response rate. The following is a summary of the key findings based on returned questionnaires.

**1. Familiar with the Project**

The targets of this investigation are the people who will be affected by this Project. Most of them have heard about the Project (83%).

**2. Benefits of the Project**

The respondents generally deem that the Project will bring multiple benefits to them, particularly hoping that the Project can improve the local economic development (70%), improve the local power supply (70%), and increase the employee opportunity (30%).

**3. Attitude of the residents toward the Project:**

The survey shows that the Project receives very strong support from local people (100%). This is closely linked to the fact that the respondents think the construction of the Project contribute to local economic development.

**E.3. Report on how due account was taken of any comments received:**

>>

The project owners attached importance to the stakeholders' comments, and held the special conference to discuss the comments. The project owners emphasized that strict environmental impact mitigation measures would be carried out during the construction and the operation phases of the proposed project.

According to comments from the stakeholders, it is not necessary to adjust the design, construction or operation of the Project.

# Annex 1

## CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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## Annex 2

## INFORMATION REGARDING PUBLIC FUNDING

>>

There is no public funding from Annex I for the proposed project

## Annex 3

### BASELINE INFORMATION

>>
The baseline information for the Project is in the charge of China DNA and can be provided to DOE for verification if necessary.

## Annex 4

### MONITORING PLAN

>>
No additional information.

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